Starting point:

ISC24 Learning Pathways BoF - Build Your Pathway!

HPC Knowledge (K)

- **Supercomputers (K1)**
  - I/O (K1.3)
  - Big Data on HPC (K1.5)
  - Operation of an HPC system (K1.4)
  - Hardware Architectures (K1.2)
  - System Architectures (K1.1)
- **Performance modelling (K2)**
  - Performance Bounds (K2.2)
  - Performance Concepts (K2.1)
  - Performance Characteristics (K2.3)
- **Parallelisation (K3)**
  - Levels of Parallelisation (K3.1)
  - Parallelisation overheads (K3.2)
  - Domain Decomposition (K3)
- **Modeling Costs (K5)**
- **Job Scheduling (K4)**
- **Data Management (K6)**
  - Data Transfer
  - Research Data Management (K6.1)

Big Data Analytics

- Theoretical principles (BDA1)
- Big Data Tools in HPC (BDA2)
- Integrating BDA with HPC workflows (BDA3)
- Machine Learning (BDA5)
- Data driven workflows (BDA4)
- Basic Knowledge (BDA6)

Use of HPC Env (USE)

- **Running parallel programs (USE2)**
- **Building Parallel Programs (USE3)**
- **Developing parallel programs (USE4)**
- **Cluster Operating System (USE1)**
- **Automating common tasks (USE5)**
- **Workflows (USE6)**
  - Workflow engines (USE6.1)
  - Cloud Workflows (USE6.2)
- **Post-processing tools (USE7)**
  - Visualisations (USE7.1)

Software Development (SD)

- **Programming Concepts for HPC (SD1)**
  - Programming Message Passing Systems (SD1.2.3)
  - Programming Shared memory systems (SD1.2.2)
  - Parallel Algorithms (SD1.2.1)
  - GPU programming (SD1.2.6)
  - Parallel Programming (SD1.2)
  - Efficient Algorithms and Data Structures (SD1.3)
  - Programming Languages (SD1.1)
- **Software Configuration Management (SD3)**
  - Release Management (SD3.4)
  - Version Control (SD3.2)
  - Issue and bug tracking (SD3.3)
  - Deployment Management (SD3.5)
- **Documentation (SD7)**
  - Requirements documentation (SD7.1)
  - Software design architecture documentation (SD7.2)
  - Source Code documentation (SD7.3)
  - Documentation for reproducibility (SD7.4)
- **Software design and architecture (SD6)**
  - Requirements elicitation and analysis (SD6.1)
  - Software architecture (SD6.3)
  - Object-oriented design (SD6.2)
- **Software Quality (SD5)**
  - Coding Standards (SD5.1)
  - Code Quality (SD5.2)
  - Refactoring (SD5.3)
  - Code Reviews (SD5.4)
- **Agile Methods (SD4)**
- **Programming Best Practices (SD2)**
  - Logging (SD2.4)
  - Portability (SD2.8)
  - Exception Handling (SD2.5)
  - Debugging (SD2.2)
  - IDEs (SD2.1)
  - Coding Standards (SD2.6)
  - Testing (SD2.8)

Performance Engineering (PE)

- **Cost awareness (PE1)**
- **Benchmarking (PE3)**
- **Measuring system performance (PE2)**
  - Using standard tools (PE2.1)
  - Profiling (PE2.2)
  - I/O performance (PE2.3)
- **Optimisation Cycle (PE5)**
- **Tuning (PE4)**
  - Tuning without building (PE4.1)
  - Tuning via reprogramming (PE4.3)
  - Tuning without building modifying source code (PE4.2)

System Administration (ADM)

- **Theoretical Principles (ADM1)**
  - Architecture (ADM1.1)
  - Software Stack (ADM1.4)
  - Networking (ADM1.2)
  - Monitoring (ADM1.5)
  - Security (ADM1.8)
- **Cluster Infrastructure (ADM2)**
  - Storage (ADM2.2)
  - Network (ADM2.1)
  - Virtualisation (ADM2.3)
  - Cooling Systems (ADM2.5)
  - Power (ADM2.4)
- **Cluster Management (ADM3)**
  - Tools (ADM3.1)
  - Resource Management (ADM3.2)
  - Parallel Shell (ADM3.3)
  - User Management (ADM3.5)
  - Monitoring (ADM3.6)
- **Software Stack (ADM4)**
  - Setup (ADM4.1)
  - Containers (ADM4.2)
  - User Environment (ADM4.3)

Learning objective:

Based on the Skill Tree developed by HPC-CF (https://www.hpc-certification.org/)